Response to the FCC Notice of Inquiry FCC03-54

Zarlink Semiconductor is a multi national company with facilities in the US, Canada and Europe. It designs and manufactures integrated circuits for various communications systems, including those ultra low power short range devices typically used in medical applications. Such devices are often used in implanted medical devices, such as those defined in CFR47 Part 95.628 of the FCC Rules.

Similar applications exist for other ultra low power, very short range devices for use by persons suffering from hearing or other disabilities, some of which may be implanted and others operated under the various provisions of CFR47 part 15. However, all these devices have common requirements of small size and very low power consumption. An example in a typical goal for a receiver for hearing aid applications is for a current consumption of 0.5mA at a supply voltage of 1 volt, with a size (including antenna) of 0.4 by 0.2 by 0.1 inches – 0.008 cubic inches.

The policy of treating the radio spectrum as a whole in determining the best method of exploitation of the technology has been shown to have significant advantages. Such an approach requires minimum receiver performances to be specified if the maximum use is to be derived from the radio spectrum. Such minimum performances however, require careful consideration as to their practicality and application.

Receiver immunity to unwanted signals needs to be considered in a number of separate but inter-related sections. Firstly, there is the classical selectivity requirement, generally extending to a few channels either side of the received frequency. Here the performance may be limited by either by selective filtering, or by the phase noise performance of any local oscillators used in frequency conversion. Secondly, there is the performance in the presence of strong signals at frequencies removed from the wanted frequency, where performance can be inhibited because of such phenomena as blocking or intermodulation. Various techniques are used to obtain immunity to signals of this sort, although in general terms, such immunity is not obtained without significant use of DC power. Finally, there are the effects of strong signals at frequencies far removed from the wanted frequency. A typical example of such a problem may be found with a lack of common mode rejection on the antenna port of TV receivers when used near moderate power transmitters such as are found in the mobile and amateur services. This immunity is more closely aligned to classical EMC (Electro Magnetic Compatability) concepts that the classical radio parameters described above.

Receivers used in very low power ultra short-range communications such as medical implants (e.g. pacemakers, muscle control for the disabled), hearing aids etc., usually use electrically and physically small antennas. Such antennas provide inherent selectivity against signals much lower than the wanted frequency, while their inefficiency at the wanted frequency tends to minimise the pick up of unwanted signals. In the case of implanted devices, body losses also provide attenuation to unwanted signals. The low power available for the receiver itself militates against the provision of high levels of immunity against blocking and intermodulating signals other by virtue of the low RF levels available from the inefficient antenna. The immunity to signals on adjacent channels is also limited by available power and integrated circuit die size, while in general, the technology does not exist to produce external filters of acceptable size and performance.

These constraints mean that although the general introduction of immunity standards for receivers may be desirable, practical constraints suggest that a multiplicity of standards are required to adequately cover all the many types of receivers in use. Certain receivers, such as the very small low power receivers described above, cannot achieve high immunity

standards, but because of their environment and small antennas, are generally unlikely to be in such RF fields as to require a high degree of immunity. Any attempt to impose high immunity standards on such receivers will in many cases, make the use of radio communication impractical, and in some cases, seriously disadvantage people with certain medical conditions.

Zarlink Semiconductor therefore recommends that if mandatory immunity standards are introduced by the FCC, their levels and applicability should be determined on the basis of the particular radio service and the practicality of application of immunity requirements.